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INCREASING OPERATIONAL CAPABILITY OF TIENTSIN--KU-YEH
SECTION OF PEIPING--SHAN-HAI-KUAN RAILWAY

Wu Chih-chiao

There is a close relationship between the operational capability of a railway and the volume of traffic actually transported on it. If it is desired to expand the latter, it may be necessary to increase the former. There are a number of ways by which this may be done, but careful consideration is required to select the measures which will prove most economical and effective.

Before liberation, the Tientsin--Ku-yeh section was overloaded and unable to meet the demands put upon it. Then, one half the daily output of the coal mines of the Kailan Mining Administration was sent westward to or toward Tientsin, and one half eastward to or toward Ch'in-huang-tao. After liberation, a number of changes took place, one of which was that the whole of the output of the Kailan coal mines was sent westward. At present, with the country on the threshold of a period of construction, the need for transportation is still more pressing. Hence a heavier transportation task devolved upon the trains operating between Tientsin and Ku-yeh, and it became urgent to increase the operational capability of this section of the line.

It is commonly thought that the best solution is simply to increase the number of locomotives and cars assigned to this traffic. But this solution cannot be used under all circumstances; it can only be used when the density of traffic is such that there is room for more trains to be operated. If the density of traffic has already reached the limit, the addition of more trains will have the opposite effect of that desired; therefore, different measures must be sought. The following is an account of how this problem was met.

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1. Remedied Conditions Which Required Slow Speeds

Due to hasty track repairs following liberation, in February 1949, there were ten places between Tientsin and Ku-yeh, beside the bridges, where the trains were obliged to proceed at slow speeds. Consequently, the average speed of trains was barely 40 kilometers per hour. Except for one or two places where it is permanently necessary to proceed slowly, the other places were gradually improved and by 1 May 1949 the speed restrictions were largely removed.

2. Raised Average Speed of Trains

After the improvements to the roadbed and track were made, on 1 May 1949 the normal operating speed was raised to 50 kilometers per hour. This shortened the running time between station stops and made it possible to run more trains. However, it was found that if the locomotives operating with the same power were to run at greater speed, then the weight of the trains had to be decreased correspondingly. In spite of this, the decreased loads carried did not wipe out the gains which had been made possible by the operation of more trains. While the speed of freight trains was held down to 50 kilometers per hour, passenger trains were permitted to run up to 80 kilometers per hour. Thus, increasing the speed of trains was one way to increase the transport capacity of the line, but it was not the most effective way.

3. Increased the Number of Sidings Where Trains Could Pass

The effect of this measure was to shorten the distance, and hence the running time, between stops, and it meant that more trains could be operated with less time spent in waiting at sidings. In one case, since trains necessarily had to slow down for the Chin-ch'i-ho bridge crossing, a temporary siding was placed near the west end of the bridge, with satisfactory results. After a number of trial improvements had been made, the longest distance between siding stops on the single track sections (east of Hsin-ho), was reduced to about 7 kilometers. That is the one between Erh-chuang and Hsu-ke-chuang and it requires 13 minutes.

According to present arrangements, the maximum number of trains it is now possible to operate per day is 38 pairs of trains. Compared with the 21 pairs, which was the maximum possible before liberation, this is an increase of over 50 percent. Thus, the placing of sidings for trains to pass at points between stations that were far apart is certainly a very effective way to increase the capacity of the section.

4. Advise the Restoration of Double Tracks

As intimated above, the demand for more train service is increasing. The plans for 1950 call for the service of 50 pairs of trains daily between Tientsin and Ku-yeh. To be able to handle this number of trains, we consider it necessary to restore double tracks to the now single track section between Hsin-ho and T'ang-shan. If this is done, 54 pairs of trains daily could be operated. If an automatic block signal system were installed in three of the longest sections, namely, Tientsin--Chun-liang-ch'eng, T'ang-shan--K'ai-p'ing, and Wa-li-Ku-yeh, then the operation of 72 pairs of trains daily would be possible.

Some people think that to double-track the line is too expensive and would take too long. Others think that to lessen or remove steep grades and sharp curves would sufficiently increase the operational capacity of the line. Again, there are those who believe that the needed greater capacity can be gained by merely installing the automatic block signal system.

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To know whether any one of these solutions will produce the desired results, it is necessary to analyze all the factors of the problem. If getting rid of grades and curves results in lengthening the line, and hence the running time between two points, this is not economical. To double-track a section, when the single track is not yet being used to its maximum capacity, is also not economical. To install automatic block signals, for traffic in both directions, between Tientsin and Ku-yeh, where the part from Hsin-ho to T'ang-shan is a single track, would increase the number of train movements by only from 20 to 25 percent, and this certainly would not meet the heavy demands that must be met. Automatic signals alone will not solve this problem. Therefore, the double track should be restored as soon as possible between Hsin-ho and T'ang-shan to meet the traffic demands.

For example, on the run between Erh-chuang and Hsu-ke-chuang [in the single track section], for which the running time is 13 minutes, suppose there are six scheduled trains, three in each direction.

- a. With the present arrangements and installations, they will require 93 minutes.
- b. If automatic signals were installed, they would require 62 minutes; but for this, it would be necessary to have at least four sidings at the stations.
- c. If the run were double-tracked, but without automatic signals, the required running time would be 45 minutes.
- d. If the run were double-tracked and the automatic signals were installed, the time required would be only 23 minutes.

From this it may be seen that the greatest operating capacity can be secured with double tracks and automatic signals. The main features of the problem and the solutions that have been worked out are summarized in the following table.

Table of Data Concerning Tientsin-Ku-yeh Section

<u>Column 1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
For explanation of column headings see below.								
Tientsin	11.1							a
Chang-kuei-chuang	12.1							b
Chun-liang-ch'eng	16.2							c
Hsin-ho	11.3	27	Hai-t'an	3	23 Aug	5.5	13	d
Pei-t'ang	4.7		Ch'iao-hsi	5	1 Nov	5.8		e
Chin-ch'i-ho	8.7	38	Pei-ho	5	1 Nov	1.1	5	f
Ch'a-tien	8.2	20	Hsiao-chuang	4	26 Oct	3.6	11	
Han-ku	7.8					4.2	9	
Lu-t'ai	6.1					4.0		
P'ei-chuang	6.4							
T'ien-chuang	10	21	Fu-chia		6 Jul	5.0		

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<u>Column 1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
T'ang-fang	12.6	30	Erh-chuang	1	1 Jun	5.0 5.7	10	
Hsu-ke-chuang	4.5					6.9	14	
Chi-chia-t'un	5.2							
T'ang-shan	9.2							g
K'ai-p'ing	6.8							b
Wa-li	8.2							g
Ku-yeh								g

Explanation of Column Headings of Above Table

1. Names of stations previously existing.
2. The distance in kilometers between the indicated previously existing stations.
3. The respective running times for the distances mentioned in Column 2.
4. Names of new stations where sidings have been added.
5. The chronological order in which the new sidings were made.
6. The dates on which the new sidings were put into use.
7. The distances between points where trains could pass, after the new sidings were made.
8. The running times for distances indicated in Column 7.
9. Notes:
 - a. The section between Tientsin and Hsin-ho is double-tracked.
 - b. The sections between Tientsin and Chun-liang-ch'eng, and between T'ang-shan and K'ai-h'ing, should be equipped with an automatic block signal system.
 - c. Bridge No 14 is located at or near this point.
 - d. A new siding should be made at or near this point. [1950 official railway timetables show that a new siding has been made at Chung-hsin-chuang, between Chun-liang-ch'eng and Hsin-ho.]
 - e. In this section the track curves sharply.
 - f. Bridge No 11 is located at or near this point; the temporary siding near the west end of this bridge now may be dispersed with.
 - g. The bridges at or near these points are weak.

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